

Desktop guide to daylighting

– for architects



ENERGY EFFICIENCY

**BEST PRACTICE
PROGRAMME**

RIBA PLAN OF WORK

The process of creating a building can be divided into a number of definable stages which take the project from the early discussions and rough sketches through to more detailed design drawings and finally to the building operations on site.

The RIBA Plan of Work does just this and divides the whole process into stages A to M. It provides a model outline procedure for methodically working through the whole design and construction process by all the different members of the design team.

At each of the stages, a different level of daylighting design input is needed. This Guide is written to reflect this need. It is written to assist the designer at Stage C (Outline Proposals), Stage D (Scheme Design) and Stage E (Detail Design).

The stages of the RIBA Plan of Work that lead up to going out to tender are:

STAGES A AND B	<i>Inception and Feasibility</i> for appraisal in order to decide whether and how to proceed.
STAGE C	<i>Outline Proposals</i> to develop the brief and determine the general approach to layout, design and construction.
STAGE D	<i>Scheme Design</i> to finalise brief, decide final direction using input from other consultants, complete a full design and submit for approvals.
STAGE E	<i>Detail Design</i> to obtain the final decisions on all matters relating to design specification, construction, and cost.
STAGE F	<i>Production Information</i> to produce the details of the design in order to complete the drawings, schedules and specifications in readiness for preparing the Bill of Quantities for tendering.
STAGE G	<i>Bill of Quantities</i> to complete the documentation for tendering.
STAGE H	<i>Tender action</i> to invite tenders from contractors.

The work described in this report was carried out by Professor Peter Tregenza of the University of Sheffield under contract as part of the New and Renewable Energy Programme, managed by the Energy Technology Support Unit (ETSU) on behalf of the Department of Trade and Industry.

CONTENTS

INTRODUCTION	4
User satisfaction and energy efficiency	4
RIBA STAGE C OUTLINE PROPOSALS	5
Skylight	5
Sunlight	5
Complex skylines	6
RIBA STAGE D SCHEME DESIGN	6
View	6
Skylight and optimum window size	7
Skylight and room appearance – the average daylight factor	7
Sunlight control	8
RIBA STAGE E DETAIL DESIGN	9
Lighting for task performance	9
Daytime electric lighting	10
FURTHER INFORMATION	12

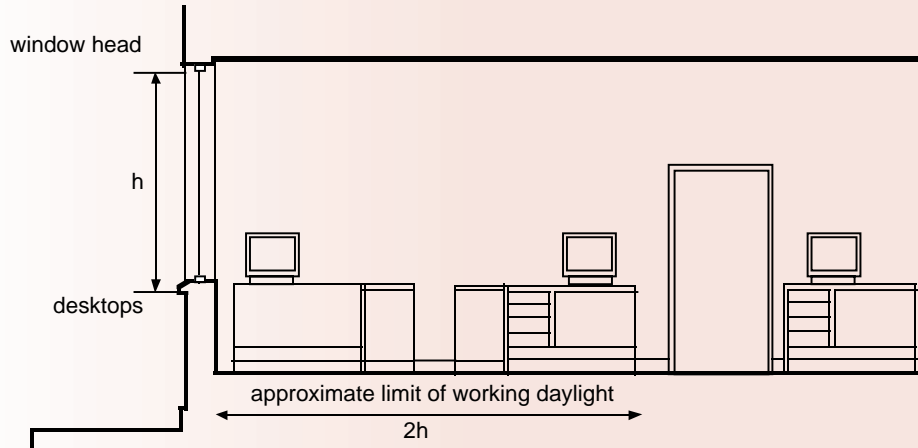


Figure 5 Zone of strong daylight

Rule of thumb

5

Surfaces that are closer to a window than twice the height ($2h$) of the window head above desktop level, receive adequate daylight for tasks for most of the working year (see figure 5).

Detail Design

RIBA stage E

Lighting for task performance

The daylight factor indicates the balance between the daylight outside and the amount of natural light within a room. It can be used as a measure of the brightness appearance because the eye adapts to the ambient level of lighting. For good working conditions it is necessary also to ensure that the task illuminance is above a minimum level. ('Illuminance' is the amount of light falling on a surface; it is measured in 'lux'.) The required illuminance depends on the purpose of the room – from 100 lux typically in corridors and changing rooms to 2000 lux for tasks involving minute detail and low contrast. To achieve high levels of daylight it is necessary to plan the room so that workplaces are related to window positions. A **rule of thumb** is illustrated in figure 5.

The rule of thumb assumes that there is no significant loss of light due to external obstructions, tinted glazing or interior screening. It then approximately defines a zone where the daylight factor is always above 2% on desktops. The rule illustrates the importance of window head height (and therefore ceiling height) to daylight distribution. The higher the window, the deeper the zone of strong daylight.

Lighting requirements of tasks, and the illuminances required, are given in the 'CIBSE Code for interior lighting'. This also outlines a method for calculating the daylight factor at a point and then using it to find the number of hours during the year that daylight would provide sufficient task illuminance. BS 8206 also gives the method. Various computer programs are available, usually as part of larger software packages, to calculate daylight factors at points in a room; these can be used with the graphs of daylight availability given in the CIBSE Code and BS 8206 to predict hours of sufficient daylight.

DETAIL DESIGN

Where activities permit, good value is given by local task lighting instead of overall workplace illumination.

Local manual switching is an alternative to automatic control but full energy savings occur only when electric lights are continuously dimmable in response to changing daylight. The high-frequency electronic ballasts required to dim

fluorescent lamps smoothly have at present a higher initial cost than conventional controls but can give lower long-term costs. They offer other efficiency savings too and are likely to become the normal solution.

With all types of environmental control in buildings, user acceptability is essential to energy-saving success.

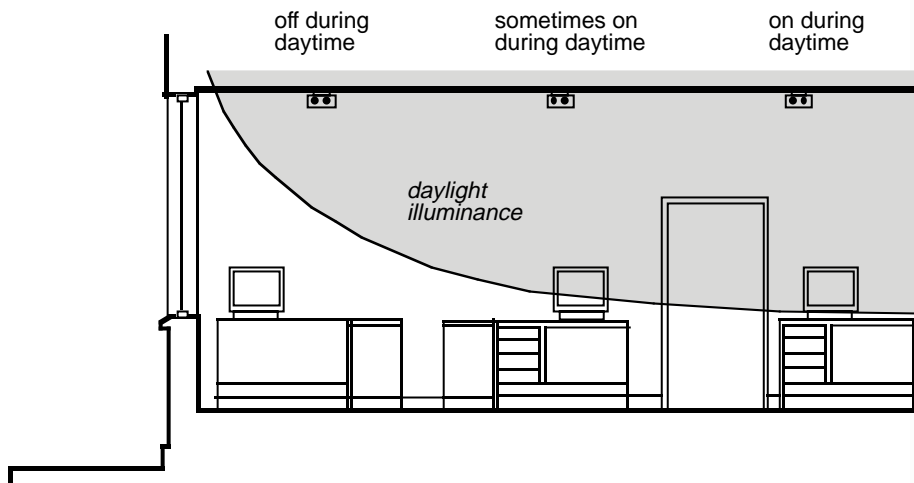


Figure 7 Control of electric lighting. (A lighting layout such as this must be checked in plan to ensure that desktop reflections are avoided.)

